REMARKS

In the last Office Action, claims 1-2 were rejected under 35 U.S.C. §102(e) as being anticipated by Sandellus (EP 1,416,314). Claims 12-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sandellus, and claims 3-5, 7, 11 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sandellus in view of Tanaka et al. (US 6,618,103) ("Tanaka").

The Examiner acknowledged applicants' claims for foreign priority under 35 U.S.C. §119 as well as receipt of the priority document, thereby perfecting the foreign priority claim. No objection was made to the drawings which are, therefore, believed to be acceptable.

The Examiner also pointed out an informality in the specification and required correction thereof.

In accordance with this response, claims 1, 4, 7, 11 and 13 have been amended, and claims 2, 3 and 14 have been canceled. Claims 5 and 12 have been retained in unamended form, and claims 6 and 8-10 were previously canceled. New claims 15-25 have been added. The specification has been revised in editorial respects to improve the wording, correct informalities including the one noted by the Examiner and to provide a direct antecedent basis for the claim language.

Applicants respectfully request reconsideration of their application in view of the foregoing amendments and the following discussion.

The present invention relates to a liquid crystal display device operable in both reflection and transmission modes and which can be made thinner than conventional liquid crystal display devices of this type with improved brightness when operating in the reflection mode.

By way of example, and with reference to the illustrative embodiment shown in Fig. 2, a liquid crystal display device according to the present invention comprises a color filter substrate 1 having a color filter disposed thereon, the color filter having a pattern of color filter regions 3R, 3G and 3b, and a counter substrate 9 opposed to the color filter substrate 1 with a liquid crystal layer 8 interposed between the two substrates. A transparent insulating film is disposed over the color filter between the color filter and the liquid crystal layer 8, and a reflective film 4 is disposed over the transparent insulating film, the reflective film having a thickness of 0.1 to 0.2 μm and having reflective film regions 4 (Fig. 2B) overlying corresponding color filter regions (such as the color filter region 3R in Fig. 2B), wherein each reflective film region has an area smaller than an area of its corresponding color filter region.

Stated otherwise, the reflective film 4 has an area smaller than an area of the colored layer forming the color filter.

By such a construction, the flatness of the inner face of the color filter substrate 1 (i.e., the flatness of the elements formed on the color filter substrate that are in contact with the liquid crystal layer 8) is dependent on the thickness of the reflective film 4 which, in accordance with the present invention, can be made extremely thin, on the order of 0.1 - 0.2 μm. This is due to the fact that the transparent insulating film covers the whole surface of the colored layer of the color filter so that the flatness of the substrate is determined by the height or thickness of the reflective film 4. If desired, a planarizing film 5 may be formed over the color filter, and the transparent insulating film may be formed over the planarizing film. Alternatively, as shown in Fig. 1A, the reflective film 4 may be formed on the color filter and a planarizing film 5 formed over the reflective film. By such a construction, there is very little surface irregularity at the interface between the liquid crystal layer and the reflective film, even without use of the planarizing film, so that there is very little difference in orientation of the liquid crystal molecules at the boundary region between the liquid crystal layer and the reflective film. This, in turn, improves the display quality as explained on pages 3-5 of the specification.

As amended, independent claim 1 recites a liquid crystal display device comprising a color filter substrate having a colored layer of a color filter formed thereon, a counter substrate opposed to the color filter substrate, and a liquid crystal layer interposed between the two substrates. Claim 1 further requires a reflective film disposed over the colored layer on the counter substrate side thereof and having an area smaller than an area of the colored layer and a thickness of 0.1 to 0.2 μm, and a transparent insulating film disposed between the reflective film and the colored layer.

New independent claim 15 is directed to a liquid crystal display device comprised of a color filter substrate having a color filter thereon, a counter substrate opposed to the color filter substrate, and a liquid crystal layer interposed between the two substrates. Claim 15 further requires a transparent insulating film disposed over the color filter between the color filter and the liquid crystal layer, and a reflective film disposed over the transparent insulating film between the transparent insulating film and the liquid crystal layer, the reflective film having a thickness of 0.1 to 0.2 μm and having reflective film regions overlying corresponding color filter regions, wherein each reflective film region has an area smaller than an area of its corresponding color filter region.

The prior art of record, including Sandellus and Tanaka, do not disclose or suggest the presently claimed invention.

Sandellus discloses a liquid crystal display device operable in reflective and emissive modes and, as shown in Figs. 1-2, the device comprises a liquid crystal layer 5 sandwiched between two substrates (not shown), a color filter layer 4 disposed on one substrate, and a reflector 2 disposed on the color filter layer 4 and having an area smaller than an area of the color filter layer 4. However, Sandellus does not disclose a transparent insulating film disposed between the reflector 2 and the color filter 4, as required by independent claims 1 and 15, and thus Sandellus neither anticipates nor renders obvious these claims.

Tanaka has been cited for its teaching of a transparent insulating film 5 disposed between a colored layer 7 and a reflective film 4. However, the reflective film 4 is part of a reflecting medium composite 18 and is formed under the colored layer 7 on the color filter substrate side of the device -- not over the colored layer on the counter substrate side thereof as required by the claims. Thus if Sandellus were modified in view of Tanaka in the manner proposed, the modified Sandellus device would have a transparent insulating film disposed between the reflector 2 and the color filter layer 4. By contrast, independent claims 1 and 15 require

that the reflective film be disposed over the transparent insulating film, which is opposite the arrangement shown in Tanaka. Moreover, in Tanaka, the surface of the color filter substrate has no surface irregularity due to the presence of the leveling film 8 and therefore there is no need to compensate for orientation differences of the liquid crystal molecules at the boundary region as in the case of the present invention. One of ordinary skill in the art would not have been led by any teaching in Tanaka to modify Sandellus to correct for a problem that is non-existent in Tanaka.

The remaining references of record have been considered though it is not seen where these references cure the deficiencies of Sandellus and Tanaka insofar as concerns the presently claimed invention.

In view of the foregoing, the application is now believed to be in allowable form. Accordingly, favorable reconsideration and passage of the application to issue are respectfully requested.

Respectfully submitted,

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July 2, 2007
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